

**FIELD INVESTIGATIONS OF
UNCONTROLLED HAZARDOUS WASTE SITES**

FIT PROJECT

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**TASK REPORT TO THE
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-01-6056**

FINAL REPORT

Hazardous Waste Site Investigation Report
Seaview Square Mall
Asbury, Park, New Jersey
TDD #02-8102-02

PREPARED BY
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Under Subcontract to

ecology and environment, inc.

International Specialists in the Environmental Sciences

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Hazardous Waste Site Investigation Report
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Asbury Park, New Jersey

TDD #02-8102-02

December 24, 1981

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SUMMARY

The Field Investigation Team (FIT) conducted a sampling trip to Seaview Square Mall, Asbury Park, N.J. on 3 March 1981. Six liquid and five sediment samples were collected. The aqueous samples contained levels of some inorganics and polynuclear aromatic hydrocarbons (PAH) in excess of the Environmental Protection Agency (EPA) Water Quality Criteria Standards (1980). Levels of the remaining PAHs and inorganics found in the soil samples were within previously recorded ranges for soils beside heavily used roads. The presence of beryllium, mercury, and six PAHs appear to be from contamination on the landfill.

The State of New Jersey and the Deal Lake Commission are trying to restore the lake to its original condition. Since a large proportion of the sedimentation in the lake is probably due to surface runoff from the mall, FIT recommends that the state be contacted over the possible hazards of dredging to restore the lake.

A Field Investigation Team (FIT) initiated well survey on 7 May 1981 also revealed previously unknown private potable drinking wells within a half mile of the mall. The direction of groundwater flow is not known, and the potential for off-site migration of the contaminants found during the sampling survey exists. In order to assure the potability of the adjacent groundwater in the drinking water wells, FIT recommends tapwater sampling.

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BACKGROUND

The Seaview Square Mall complex is located in Asbury Park, N.J. Figure 1 provides the location of the site in the Asbury Park Quadrangle and New Jersey.

The Seaview Square Mall was constructed in 1976 and is approximately 25 - 30 acres in size. The mall is sited atop a closed landfill area operated by M & T Delisa which totalled 132 acres. The landfill operated for approximately 30 years prior to 1975 when the landfill was closed. The property is bordered by Routes 18, 66 and 35 to the west, south and east respectively. An industrial park lies to the north.

While it was operating, the M & T Delisa landfill operated as a sanitary landfill. According to the last permit filed with New Jersey Solid Waste Administration, M & T Delisa accepted only solid municipal waste. During the years the landfill was active, a common practice was to combine the garbage with fly ash. This practice was probably followed at this site, thereby explaining the high levels of some inorganics and the presence of some of the coal tar derivatives in the samples.

The mall itself is situated on clean fill. The area beneath the building was excavated to a natural clay barrier and the garbage was redistributed over the entire site and clean fill put into the excavation. The parking lot, which was built on the garbage, shows settling and discoloration and methane gas vents are located around it. A leachate collection system runs underneath the parking lot from the northeast to the southwest. According to Mr. Robert Dolan of the Seaview Square Joint Venture and Goodman Company, the leachate goes directly into the city sewers.

There are storm drains along the southern edge of the property which receive parking lot runoff; these drains empty into detention basins via connecting pipes. The basins were installed in an effort to control the considerable sediment deposition that occurred when the mall was being built. Leachate streams and/or seeps have been observed coming into the stream on all EPA and Fit site inspection. Strong chemical odors have also been noted at these times. The stream empties into Deal Lake less than a mile away.

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Geology

The Seaview Square property lies in the Atlantic Ocean drainage basin. This area receives its groundwater from the Raritan-Magothy formation and is characterized by sandy soil with alternating clay layers. Groundwater flows in a southeasterly direction towards the ocean. Water quality in this aquifer is excellent except for high levels of iron and manganese.¹ Blueprints of the mall indicate that groundwater was dug into when the landfill was operating.

When the mall was built in 1975, the garbage was redistributed over the entire 132 acre site. Under these conditions, mounding of the garbage and a subsequent backflow of the groundwater could occur. The construction in this area and redistribution of the garbage would, most likely, have changed the pre-mall groundwater flow patterns. It is impossible to predict, based on available information, the pattern of groundwater flow in the area.

The area surrounding Seaview Square Mall is naturally acidic (FIT recorded a pH of 4 to 5 in the March 1981 Field Investigation). Conditions of low pH increase the solubility of many inorganics. And additionally, the combination of extremely high levels in the soil of the various inorganics and coal tar derivatives and their presence over an extended period of time favors these chemicals reaching equilibrium with the groundwater.

The landfill was originally situated at the top of the 132 acre site. Given the placement, some garbage may have migrated or been redistributed to the west of Route 18. The FIT noticed old glass bottles and various debris when collecting the sample west of Route 18.

State and Local Involvement

In 1885, a dam was constructed across the outlet of Deal Lake to provide an inland lake for recreational purposes. The State of New Jersey Department of Environmental Protection (NJDEP), Water Resources in conjunction with the Deal Lake Commission is trying to restore Deal Lake to its original condition. In the NJDEP's draft, "Deal Lake Restoration Planning Study", the problem of severe sedimentation into the lake is described in detail. For the past 35 years, a

¹Note: References are provided in Appendix C

severe sediment buildup on the bottom of the lake and at the headwaters has occurred. Five hundred foot sedimentation bars are said to be due to the construction of Seaview Square Mall alone.

The lake is currently used only for fishing but the state no longer stocks it as it is not considered cost-effective. The Commission and the NJDEP would like the lake to become a recreational area again and the report proposes dredging and dumping the dredged soil into the ocean and at local landfills. If a large proportion of the sedimentation in the lake is from the mall, dredging would expose very high levels of inorganics and coal tar derivatives.

FIELD INVESTIGATION TEAM SAMPLING TRIP AND WELL SURVEY

On 3 March 1981, five Field Investigation Team (FIT) members: Amelia Janisz, David Lipsky, Scott Butterfield, Edward Moore and Brian Jacot conducted a combined preliminary site investigation and sampling trip. Six aqueous and five sediment samples were collected at the locations indicated in Figure 2.

Appendix A contains the tabulated results of the FIT and EPA Sampling trips. The sample numbers indicated at the various locations in Figure 2 correspond to the sample numbers and results listed in Appendix A. Water and sediment samples were collected from a stream to the west of Route 18, from the stream bordering the property on the west and the east of Route 18, as the stream drains the property on the east, and before the stream enters Deal Lake. A leachate sample was collected from the leachate collection tank located under the parking lot. An additional water sample was collected at the outfall of the storm drains and an additional sediment sample upstream of Deal Lake.

Additionally, on May 7, 1981, four FIT members: (Amelia Janisz, Peter Cangialosi, Frances Barker and Edward Moore) surveyed the residential areas surrounding Seaview Square Mall to locate private wells. Town health officers were notified and Mr. William Brown, Chief Sanitarian of Ocean Township and an associates came with the FIT to observe and assist in the survey. The survey was introduced to homeowners within 1/2 mile of the mall as a survey on groundwater use. The FIT members made no reference to possible pollutants or to the mall although it is general knowledge that the mall was built on a garbage dump. The town health officers showed their badges and credentials whenever residents were mildly suspicious. FIT members also showed letters of

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private water. If the answer was public water, FIT members said thank you and left. Homeowners were generally cooperative. Alarm was evidenced by homeowners to the west of the site who complained that their water 'tasted bad'. Also one 12 year old boy in the area to the east of the site asked if his water was polluted.

RESULTS

Stream and leachate sample results from the March 1981 trip to Seaview Square Mall were found to have high levels of some inorganics (Table 1) as compared to the EPA Water Quality Criteria Standards (10/80). Levels of these substances in the sediment samples were much higher (Table 2).

Levels of flourene and phenanthrene were 0.1 ug/l each and acenapthene was 0.2 ug/l in the aqueous leachate sample. The average level of polynuclear aromatic hydrocarbons (PAH) in raw and finished water for most U.S.cities studied by Basu and Saxena (1977, 1978) was 0.0135 ug/l and flouranthene was the only PAH found. The combined PAH in the aqueous leachate sample at Seaview Square Mall was 0.40 ug/l. Benzo(a)pyrene, another coal tar derivative, which is very soluble in water, was also present in the sediments.

FIT also noted during the survey that leachate seeps were coming from the east side of the west stream bank (stream bank closest to the mall), a detergent-type foam was present near several areas on the stream banks and severe erosion, i.e. protruding trash, was present on top of the landfill.

The well survey located previously unknown private potable drinking water wells within 1/2 mile from Seaview Square Mall (Figure 3).

DISCUSSION

Inorganics

1) Copper, zinc and lead.

The presence of copper, zinc and lead in the aqueous and sediment samples is most probably due to the proximity of the site to the highways and the mall

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TABLE 1

Priority Pollutants Found in Surface Water Samples at Seaview Square Mall, Asbury Park, N.J. Exceeding the Water Quality Criteria Standards for Human Health.

Pollutant	Range of ug/l in Aqueous Samples		Water Quality Criteria EPA
	EPA Sampling Date June 1980	FIT Sampling Date May 1980	October 1980
Inorganics			
Arsenic	10.0	0.05 - 3.9	0.002
Beryllium		0.1 - 18.0	0.0037
Copper	44.0	1.0 - 24.0	1.0
Lead	60.0 - 380.0	40.0	50.0
Mercury	0.47	0.2	0.144

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TABLE 2

Priority Pollutants Found in Sediment Samples at Seaview Square Mall,
Asbury Park, N.J.

Priority Pollutant	Range of ug/kg		
	EPA	FIT	
	Sampling Date June 1980	Sampling Date March 1980	
<hr/>			
Base Neutral Extractables			
Acenaphthene	34.0	6.7 -	73.0
Fluoranthene	450.0	17.0 -	990.0
Benzo (a) anthracene	130.0	27.0 -	270.0
Benzo (a) pyrene	100.0	27.0 -	240.0
Chrysene	160.0	27.0 -	280.0
Acenaphthylene	-		100.0
Anthracene	100.0	37.0 -	100.0
Fluorene	45.0	33.0 -	120.0
Phenanthrene	490.0	27.0 -	350.0
Pyrene	370.0	27.0 -	950.0
Isomers Benzo (B/K) Fluoran	174.0	33.0 -	1400.0
Napthalene	37.0		
Inorganics			
Arsenic	1000.0 -	4600.0	NA
Copper	3300.0 -	9000.0	NA
Mercury	230.0 -	690.0	NA
Lead	59000.0 -	65000.0	NA
Zinc	14000.0 -	30000.0	NA

NA = Not analyzed for

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parking lot runoff (Figure 3). Zinc is used as a filler materials in tires and as a stabilising additive to motor oils.² Copper is used in metal platings, bearings, bushings and other internal engine parts and is also deposited from copper impregnated brake linings.³ And the primary source of lead is the gasoline burned by cars. A comparison of the levels of these inorganics found in aqueous freeway runoff, leachate characteristics at 20 municipal solid waste dumps, and the aqueous samples at Seaview Square Mall follows:

AQUEOUS CONCENTRATIONS OF LEAD, ZINC AND COPPER

Inorganic	Range of ug/l		
	Leachate at Municipal Dumps ⁴	FIT and EPA Aqueous Samples	Freeway Runoff ⁵
Lead	0.001 - 0.002	40.0 - 380.0	600 - 5000
Zinc	0 - 0.37	50.0 - 180.0	10 - 1500
Copper	0 - 0.009	1.0 - 44.0	100

The concentrations of lead, zinc and copper at Seaview Square Mall are higher than municipal leachate concentrations but are within the range for freeway runoff. It seems more probable then that these concentrations are due to highway runoff.

The majority of lead is immobilized within the top few centimeters of soil. By the time, the water in the south stream has reached Deal Lake, the lead level is below the EPA Water Quality Criteria Standards (1980) which may be due to adsorption onto sediment particles. Copper may also be adsorbed similarly. Zinc levels never exceed the 5000 ug/l EPA 1980 Standards.

Nonpoint sources such as runoff from agricultural lands, mineralized areas and urban areas may also make significant contributions⁶ to the surface water around the mall.

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2) Arsenic

Arsenic is widely distributed in the waters of the U.S. but generally in low concentrations.⁷ The median value for river water is 10 ug/l but in an analysis of 1,577 surface waters mean concentrations were 64 ug/l.² Possible sources of arsenic are coal-fueled power plants,⁷ industrial wastes, metals mining, primary metals, pharmaceuticals, inorganic chemicals or petroleum refining.⁸

A comparison of background levels in the soil to levels of arsenic and mercury found in the soils at Seaview Square Mall follows:

CONCENTRATIONS OF MERCURY AND ARSENIC IN SOILS

Inorganic	EPA (ppm)	Background Level (ppm)
Arsenic	1.0 - 4.6	0.1 - 40 ⁹
Mercury	0.23 - 0.69	0.05 - 0.10, 10, 11

The levels of arsenic in the soil samples are within the general background range for this metal.

Levels of arsenic in the aqueous samples are 2 1/2 to 5,000 times greater than the EPA 1980 Water Quality Criteria Standards. The solubility of this metal would be encouraged by the naturally acidic conditions¹ around the mall. Since the possible number of sources for this metal are numerous and the levels of arsenic in the aqueous and sediment samples do not exceed those found in previous studies, these concentrations cannot be solely to the contamination from the landfill.

3) Mercury

Mercury found in the soil at this site exceeded soil background levels (see Arsenic) and mercury levels in the aqueous samples were highest in the swamp

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area. The actions of microorganisms in the swamp would transform elemental mercury to methylmercury, a more toxic compound,¹² which is more easily assimilated by the human beings. Principal sources of mercury contamination in the environment are fungicides and atmospheric contamination from evaporation of metallic mercury. The landfill may have been recipient of wastes containing mercury from electronic apparatus industries, laboratories, pharmaceutical companies or sewage sludge.¹² Another point of consideration is that the mobility of mercury in soils is increased in the presence of leachates from municipal landfills.⁸ The mercury levels in the streams exceeded the EPA Water Quality Criteria Standards (1980). Mercury contamination of groundwater may be a problem at this site.

4) Beryllium

Another inorganic pollutant found in the aqueous samples that exceeded the EPA Water Quality Criteria Standards (1980) was beryllium. Principal sources of beryllium are the combustion of fossil fuels, atmospheric fallout, and municipal and industrial discharges. Analyses of surface, ground and rain waters have shown that, in general, beryllium concentrations are well below 1 ug/l and the average concentration of beryllium in fresh surface water is less than 1 ug/l.¹³ Analyses of 1,577 drinking water samples in the U.S. showed beryllium concentrations ranging from 0.01 to 1.22 ug/l, with a mean value of 0.19 ug/l. In the presence of high pH, beryllium, however, is very soluble. The beryllium concentrations in the soil at the mall are unknown.

The concentrations of beryllium in the stream samples increase downstream of the mall storm sewers whereas upstream, beryllium concentrations are within previously recorded background levels. These concentrations indicate that some previous dumping at the site may be responsible for these levels. Aqueous beryllium is not a serious problem because it is not absorbed very well by the gut. Major problems come from skin contact and inhalation.² Laboratory studies, however, have yielded positive results on laboratory animals and suggestive studies in human epidemiology indicate that beryllium poses a carcinogenic risk.

In summary, the levels of inorganics found in water and in the soils with the exceptions of mercury and beryllium do not exceed background levels recorded

by other authors and cannot be attributed to contamination by the landfill. Contamination of groundwater by mercury and beryllium may be a problem but will depend upon the actual concentrations found in any drinking water supplies around the mall.

Polynuclear Aromatic Hydrocarbons (PAH)

The PAHs found in the sediments at Seaview Square Mall were acenaphthene, fluoranthene, benz(a) anthracene, chrysene, acenaphthylene, benzo(a)pyrene, anthracene, fluorene, phenanthrene, pyrene and isomers of benzo(b/k) fluoran. PAHs are extremely complex mixtures containing up to several thousand components,¹⁴ so all PAHs were combined to give the total PAHS presented in Figure 4. Figure 4 provides the levels of total PAH at EPA and FIT sampling stations. While PAHs are produced by natural combustion i.e. decomposition of wood and vegetation most PAHs probably arise from combustion or heating of fossil fuels. As the total PAHs on Figure 4 illustrate, PAHs accumulate downstream of the mall. This may be due to the sediment runoff during the mall construction.

Fluorene and phenathrene were present in the leachate sample at 0.1 ug/l each and acenaphthene at 0.2 ug/l. The average level of polynuclear aromatic hydrocarbons (PAH) in raw and finished water for most U.S. cities was 0.0134 ug/l² and fluoranthene was the only PAH found. The combined PAH in the aqueous leachate sample at Seaview Square Mall was 0.40 ug/l. Benzo(a)pyrene, another coal tar derivative, which is very soluble in water, was also present in the sediments. It is possible that these chemicals maybe in the groundwater near the mall.

Since PAHs are produced both by natural combustion and fossil fuel combustion, the source of the PAHs found at Seaview Square Mall is of primary concern. Table 4 provides the PAHs found at Seaview Square Mall and their possible sources. Six of these PAHs: acenaphthene, chrysene, acenaphthylene, fluorene, naphthalene and isomers of benzo (b/k) fluoran are not found in automobile products or by-products. These are present in the air near major cities and probably originate with fossil fuel combustion.

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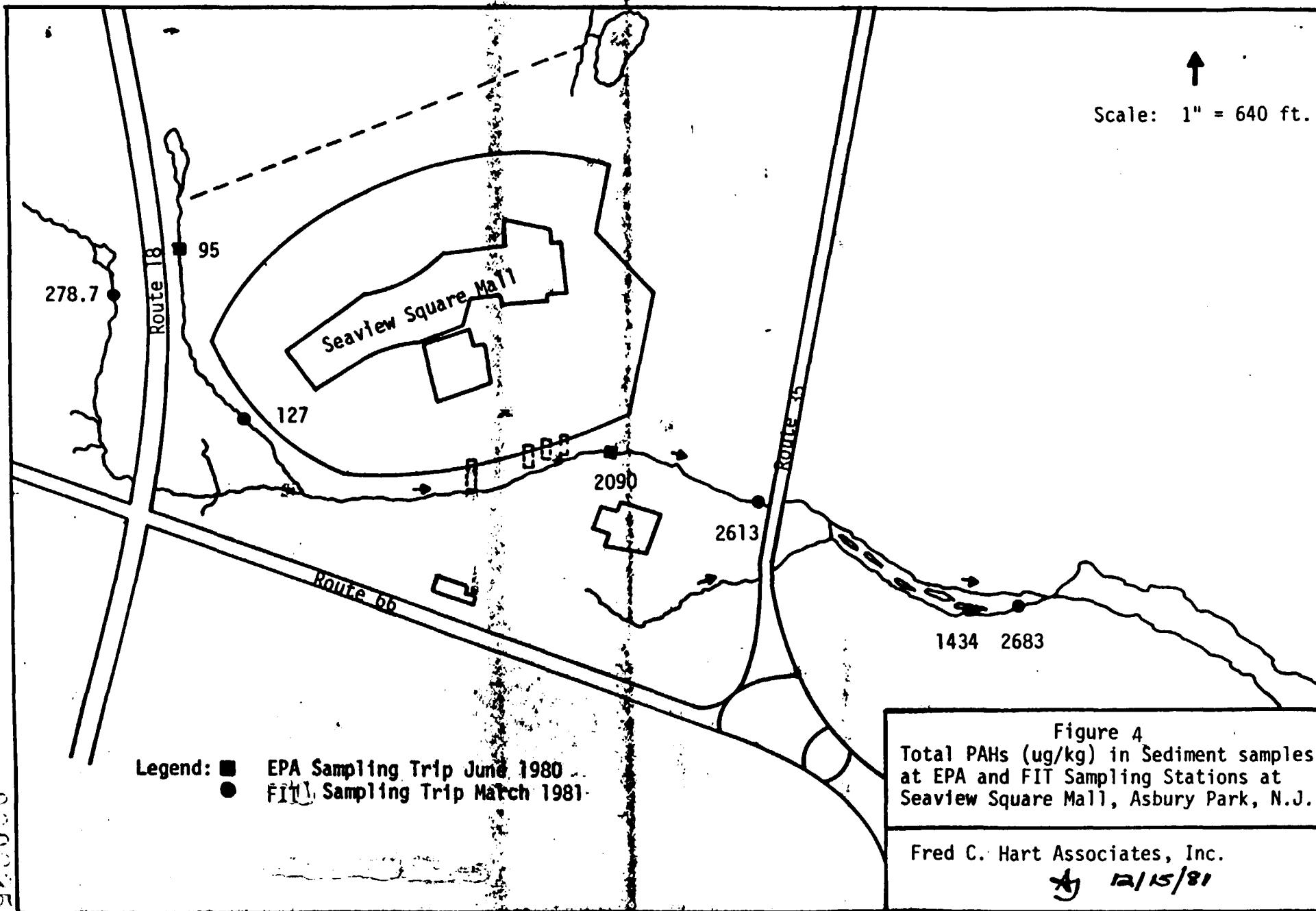


TABLE 3

PAHs Found at Seaview Square Mall and Possible Sources

Name	Coal ¹⁵	Air (Possibly Fossil Fuel Combustion) ^{16,17}	Gasoline & Diesel Exhaust ¹⁶	Tires ¹⁸	Gas & Oil ¹⁹	Grass Clippings, Leaves, Branches ¹⁹
Acenaphthene		X				
Fluoranthene	X	X		X	X	X
Benz(a)anthracene	X	X		X	X	X
Benzo(a)pyrene	X	X	X	X	X	X
Chrysene	X	X				
Anthracene	X	X		X	X	X
Fluorene		X				
Phenanthrene	X	X		X	X	
Pyrene	X	X	X	X	X	X
Isomers Benzo(b/k) fluoran						
Acenaphthylene		X				
Naphthalene		X				

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A comparison of three PAH concentrations in forests, in soil near traffic and at Seaview Square Mall follows:

	CONCENTRATIONS OF PAHs IN SOILS (ug/kg)		
	<u>Forest¹⁴</u>	<u>Soil near traffic¹⁴</u>	<u>Range Seaview Square Mall</u>
Benzo(a)pyrene	Up to 1300	Up to 2000	27 - 240
Chrysene	-	-	27 - 280
Benz(a)anthracene	5 - 20	1500	27 - 270

The levels of benzo (a) pyrene and benz(a) anthracene are below the maximum traffic concentrations. Chrysene is not present either in natural combustion or in soil near traffic. This PAH is found in soils polluted by coal tar pitch.¹⁴ Significantly, chrysene also accumulated downstream of the mall storm drains. This PAH, then, and the other five previously listed are due to fossil fuel pollution on the landfill. The solubility of PAHs in water is essentially zero, but they may exist in water in association with organic matter or colloids as formed by synthetic detergents.²⁰ Groundwater, in general, is least contaminated by PAHs since they are filtered by the soil and the general range for carcinogenic PAH concentrations in groundwater is 0.01 to 0.1 ug/l.¹⁴ However, contaminated waters can have seriously large PAH concentrations. Since the soil around the mall is contaminated, the PAHs may be in the groundwater around the mall and also present in the nearby drinking wells.

CONCLUSIONS AND RECOMMENDATIONS

Only two of the inorganics and six of the PAHs found in the water and sediment samples were attributable to contamination by the landfill. The possible sources of contamination were the dumping of fly ash and fungicides on the landfill. The levels of PAHs in the leachate suggest that the PAHs are soluble in the groundwater near the mall. All eight chemicals are suspected to have a detrimental effect on human health if consumed in excess of the EPA Water Quality Criteria Standards (1980). The two major problems on this site are:

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1) The potential contamination of a potable water supply.

2) Contamination of the soil.

The soil contamination is potentially serious if Deal Lake is dredged or the mercury and beryllium levels are as high continually or higher than were found in the samples. Any enforcement case, however, should be delayed until after well water samples are taken in order to provide more complete data for an enforcement case. As the interim report on Seaview Square Mall found, contamination of the private drinking wells around the site may exist.

FIT recommends the following actions:

1) Contact the NJDEP to inform them of the possible hazards involved in dredging Deal Lake to restore it to its original condition.

2) Sample the private drinking water wells to ascertain if there is any contamination from the landfill.

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A P P E N D I X A
S A M P L I N G R E S U L T S

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SEAVIEW SQUARE MALL, ASBURY PARK, N.J.

BASE NEUTRAL EXTRACTABLES	WATER		SAMPLE NUMBER					
	3305		3306		3307		3301	3308
Acenaphthene								
1,2,4-Trichlorobenzene								
Hexachlorobenzene								
Hexachloroethane								
Bis(2-chloroethyl)ether								
2-Chloronaphthalene								
1,2-Dichlorobenzene								
1,2-Dichlorobenzene								
1,4-Dichlorobenzene								
3,3-Dichlorobenzidine								
2,4-Dinitrotoluene								
2,6-Dinitrotoluene								
1,2-Diphenylhydrazine								
Fluoranthene								
4-chlorophenyl phenyl ether								
4-Bromophenyl phenyl ether								
Bis(2-chloroisopropyl)ether								
Bis(2-chloroethoxy)methane								
Hexachlorobutadiene								
Hexachlorocyclopentadiene								
Isophorone								
Naphthalene								
Nitrobenzene								
N-nitrosodimethylamine								
N-nitrosodiphenylamine								
N-nitrosodi-n-propylamine								
Bis(2-ethylhexyl) phthalate	486.0		496.0				600.0	
Butyl benzyl phthalate								
Di-n-butyl phthalate	0.60		0.50		1.0		0.60	1.0
Di-n-octyl phthalate					1.5			1.7
Diethylphthalate								
Dimethylphthalate								
Benzo(a)anthracene (1,2-benzanthracene)								
Benzo(a) pyrene								
Benzo(b) fluoranthene								
Benzo(k) fluoranthene								
Chrysene								
Acenaphthylene								
Anthracene								
Benzo(ghi) perylene (1,12-Benzopyrene)								

Blank spaces indicate that the chemical was not detected.

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SAMPLE NUMBER

	3305		3306		3307		3301		3308
Fluorene									
Phenanthrene									
Dibenzo(a,h) anthracene (1,2,5,6-dibenzanthracene)									
Indeno (k,2,3-cd) pyrene									
2,3,7,8-tetrachlorodibenzo- p-dioxin (TCDD)									
Benzidine									
Pyrene									

ACID COMPOUNDS

2,4,6-trichlorophenol									
p-chloro-m-cresol									
2-chlorophenol									
2,4-dichlorophenol									
2,4-dimethylphenol									
2-nitrophenol									
4-nitrophenol									
2,4-dinitrophenol									
4,6-dinitro-o-cresol									
pentachlorophenol									
phenol									

PESTICIDES

aldrin									
dieldrin									
chlordane									
4,4'-DDT									
4,4'-DDE									
4,4'-DDD									
α -endosulfan									
β -endosulfan									
endosulfan sulfate									
endrin									
endrin aldehyde									
heptachlor									
heptachlor epoxide									
α -BHC									
β -BHC									
γ -BHC									
δ -BHC									
PCB-1242									
PCB-1254									
PCB-1221									
PCB-1232									
PCB-1248									
PCB-1260									
PCB-1016									

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Blank spaces indicate that the chemical was not detected.

SAMPLE NUMBER

	3305		3306		3307		3301		3308
Toxaphene*									
Mirex									

VOLATILES

Benzene									
Carbon Tetrachloride									
Chlorobenzene									
1,2-Dichloroethane									
1,1,1-Trichloroethane									
1,1-Dichloroethane									
1,1,2-Trichloroethane									
1,1,2,2-Tetrachloroethane									
Chloroethane									
Bis (chloromethyl) ether									
2-Chloroethyl vinyl ether (mixed)									
Chloroform									
1,1-dichloroethylene									
1,2-trans-Dichloroethylene									
1,2-dichloropropane									
1,3-Dichloropropylene (1,3-Dichloropropene)									
Ethylbenzene									
Methylene Chloride (Dichloromethane)									
Methyl Chloride (Chloromethane)									
Methyl bromide (Chloromethane)									
Bromoform (Tribromomethane)									
Bromodichloromethane									
Trichlorofluoromethane									
Dichlorodifluoromethane									
Dibromochloromethane									
Tetrachloroethylene									
Toluene									
Trichloroethylene									
Vinyl chloride									
Acrolein									
Acrylonitrile									

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SAMPLE NUMBER

INORGANICS

	3305	3306	3307	3301	3308
Aluminum					
Chromium	7.0	7.0	7.0	7.0	7.0
Barium					
Beryllium	0.1	0.1	0.55	18.0	0.55
Cadmium	4.0	4.0	4.0	4.0	4.0
Cobalt					
Copper	24.0	1.0	1.0	1.0	1.0
Iron					
Lead	40.0	40.0	40.0	40.0	40.0
Nickel	20.0	20.0	20.0	20.0	20.0
Manganese					
Zinc	180.0	170.0	73.0	50.0	77.0
Boron					
Vanadium					
Calcium					
Magnesium					
Sodium					
Arsenic	3.9	0.40	0.05	1.1	0.05
Antimony	20.0	20.0	20.0	20.0	20.0
Selenium	0.03	0.03	2.2	0.03	0.03
Thallium	2.0	2.0	4.0	5.0	2.0
Mercury	0.2	0.2	0.2	0.2	0.2
Tin					
Silver	2.0	2.0	2.0	2.0	2.0
Ammonia *					
Fluoride *					
Sulfide *					
Cyanide *					
pH					
TOC					

Blanks spaces indicate that the chemical was not detected.

*Blank spaces indicate that the chemical was not included in the analysis.

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SAMPLE NUMBER

Blank spaces indicate that the chemical was not detected.

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SAMPLE NUMBER

[illegible]

ACID COMPOUNDS

2,4,6-trichlorophenol									
p-chloro-m-cresol									
2-chlorophenol									
2,4-dichlorophenol									
2,4-dimethylphenol									
2-nitrophenol									
4-nitrophenol									
2,4-dinitrophenol									
4,6-dinitro-o-cresol									
pentachlorophenol									
phenol									

PESTICIDES

aldrin									
dieldrin									
chlordan									
4,4'-DDT									
4,4'-DDE									
4,4'-DDD									
α -endosulfan									
β -endosulfan									
endosulfan sulfate									
endrin									
endrin aldehyde									
heptachlor									
heptachlor epoxide									
α -BHC									
β -BHC									
γ -BHC									
δ -BHC									
PCB-1242									
PCB-1254									
PCB-1221									
PCB-1232									
PCB-1248									
PCB-1260									
PCB-1016									

Blank spaces indicate that the chemical was not detected.

000045

SAMPLE NUMBER

	3600								
toxaphene*									
Mirex									

VOLATILES

Benzene									
Carbon Tetrachloride									
Chlorobenzene	3.7								
1,2-Dichloroethane									
1,1,1-Trichloroethane									
1,1-Dichloroethane									
1,1,2-Trichloroethane									
1,1,2,2-Tetrachloroethane									
Chloroethane									
Bis (chloromethyl) ether									
2-Chloroethyl vinyl ether (mixed)									
Chloroform									
1,1-dichloroethylene									
1,2-trans-Dichloroethylene									
1,2-dichloropropane									
1,3-Dichloropropylene (1,3-Dichloropropene)									
Ethylbenzene									
Methylene Chloride (Dichloromethane)									
Methyl Chloride (Chloromethane)									
Methyl bromide (Chloromethane)									
Bromoform (Tribromomethane)									
Bromodichloromethane									
Trichlorofluoromethane									
Dichlorodifluoromethane									
Dibromochloromethane									
Tetrachloroethylene									
Toluene									
Trichloroethylene									
Vinyl chloride									
Acrolein									
Acrylonitrile									

Blank spaces indicate that the chemical was not detected.

000646

SAMPLE NUMBER

INORGANICS									
	3600								
Aluminum									
Chromium	7.0								
Barium									
Beryllium	0.55								
Cadmium	4.0								
Cobalt									
Copper	1.0								
Iron									
Lead	4.0								
Nickel	20.0								
Manganese									
Zinc	10.0								
Boron									
Vanadium									
Calcium									
Magnesium									
Sodium									
Arsenic	0.85								
Antimony	20.0								
Selenium	0.03								
Thallium	2.0								
Mercury	0.2								
Tin									
Silver	2.0								
Ammonia *									
Fluoride *									
Sulfide *									
Cyanide *									
pH									
TOC									

Blank spaces indicate that the chemical was not detected.

*Blank spaces indicate that the chemical was not included in the analysis.

SEAVIEW SQUARE MALL, ASBURY PARK, NEW JERSEY

SEDIMENT	SAMPLE NUMBER							
BASE NEUTRAL EXTRACTABLES	3104		3105		3101		3106	3107
Acenaphthene	6.7				20.0			73.0
1,2,4-Trichlorobenzene								
Hexachlorobenzene								
Hexachloroethane								
Bis(2-chloroethyl)ether								
2-Chloronaphthalene								
1,2-Dichlorobenzene								
1,2-Dichlorobenzene								
1,4-Dichlorobenzene								
3,3-Dichlorobenzidine								
2,4-Dinitrotoluene								
2,6-Dinitrotoluene								
1,2-Diphenylhydrazine								
Fluoranthene	57.0		40.0		420.0		17.0	990.0
4-chlorophenyl phenyl ether								
4-Bromophenyl phenyl ether								
Bis(2-chloroisopropyl)ether								
Bis(2-chloroethoxy)methane								
Hexachlorobutadiene								
Hexachlorocyclopentadiene								
Isophorone								
Naphthalene								
Nitrobenzene								
N-nitrosodimethylamine								
N-nitrosodiphenylamine								
N-nitrosodi-n-propylamine								
Bis(2-ethylhexyl) phthalate	800.0		1100.0		2300.0		730.0	7800.0
Butyl benzyl phthalate			33.0		120.0		43.0	
Di-n-butyl phthalate	500.0		290.0		350.0		140.0	740.0
Di-n-octyl phthalate	23.0							
Diethylphthalate			47.0		40.0		37.0	
Dimethylphthalate								
Benzo(a)anthracene (1,2-benzanthracene)	27.0				270.0			
Benzo(a) pyrene	27.0				240.0			
Benzo(b) fluoranthene								
Benzo(k) fluoranthene								
Chrysene	27.0				280.0			
Acenaphthylene								100.0
Anthracene	37.0				53.0			100.0
Benzo(ghi) perylene (1,12-Benzoperylene)								

Blank spaces indicate that the chemical was not detected.

000648

SAMPLE NUMBER

	3104		3105		3101		3106		3107
Fluorene					33.0				120.0
Phenanthrene			27.0		307.0				350.0
Dibenzo(a,h) anthracene (1,2,5,6-dibenzanthracene)									
Indeno (k,2,3-cd) pyrene									
2,3,7,8-tetrachlorodibenzo- p-dioxin (TCDD)									
Benzidine									
Pyrene	47.0		27.0		430.0		17.0		950.0
ISOMERS BENZO (B/K) FLOURAN	50.0		33.0		560.0		1400.0		
ACID COMPOUNDS									

2,4,6-trichlorophenol									
p-chloro-m-cresol									
2-chlorophenol									
2,4-dichlorophenol									
2,4-dimethylphenol									
2-nitrophenol									
4-nitrophenol									
2,4-dinitrophenol									
4,6-dinitro-o-cresol									
pentachlorophenol									
phenol									

PESTICIDES

aldrin									
dieldrin									
chlordane									
4,4'-DDT									
4,4'-DDE									
4,4'-DDD									
α -endosulfan									
β -endosulfan									
endosulfan sulfate									
endrin									
endrin aldehyde									
heptachlor									
heptachlor epoxide									
α -BHC									
β -BHC									
γ -BHC									
δ -BHC									
PCB-1242									
PCB-1254									
PCB-1221									
PCB-1232									
PCB-1248									
PCB-1260									
PCB-1016									

000648

Blank spaces indicate that the chemical was not detected.

SAMPLE NUMBER

	3104		3105		3101		3106		3107
toxaphene*									
Mirex									

VOLATILES

Benzene									
Carbon Tetrachloride									
Chlorobenzene									
1,2-Dichloroethane									
1,1,1-Trichloroethane									
1,1-Dichloroethane									
1,1,2-Trichloroethane									
1,1,2,2-Tetrachloroethane									
Chloroethane									
Bis (chloromethyl) ether									
2-Chloroethyl vinyl ether (mixed)									
Chloroform									
1,1-dichloroethylene									
1,2-trans-Dichloroethylene									
1,2-dichloropropane									
1,3-Dichloropropylene (1,3-Dichloropropene)									
Ethylbenzene									
Methylene Chloride (Dichloromethane)									
Methyl Chloride (Chloromethane)									
Methyl bromide (Chloromethane)									
Bromoform (Tribromomethane)									
Bromodichloromethane									
Trichlorofluoromethane									
Dichlorodifluoromethane									
Dibromochloromethane									
Tetrachloroethylene									
Toluene									
Trichloroethylene									
Vinyl chloride									
Acrolein									
Acrylonitrile									

Blank spaces indicate that the chemical was not detected.

000650

SAMPLE NUMBER

INORGANICS	3104		3105		3101		3106		3107
Aluminum									
Chromium									
Barium									
Beryllium									
Cadmium									
Cobalt									
Copper									
Iron									
Lead									
Nickel									
Manganese									
Zinc									
Boron									
Vanadium									
Calcium									
Magnesium									
Sodium									
Arsenic									
Antimony									
Selenium									
Thallium									
Mercury									
Tin									
Silver									
Ammonia									
Fluoride									
Sulfide									
Cyanide									
pH									
TOC									

Blank spaces indicate that the chemical was not analyzed for.

000651

U. S. ENVIRONMENTAL PROTECTION AGENCY
SAMPLING TRIP RESULTS JUNE, 1980

PRIORITY POLLUTANTS

SAMPLING LOCATION

	UPSTREAM SEDIMENT ug/kg	DOWNSTREAM AQUEOUS ug/l	SEDIMENT ug/kg	STORM DRAIN MIDDLE DETENTION TANK - AQUEOUS ug/l	TRIBUTARY TO EAST DETENTION BASIN-AQUEOUS ug/l	UPSTREAM FORK ug/l	EAST SWAMP ug/l
<u>Base Neutral Extractable</u>							
Acenaphthene			34				
Fluoranthene			450				
Naphthalene			37				
1,2-benzanthracene			130				
Benzo (a) pyrene			100				
1,2-benzofluoranthene			87				
3,4-benzofluoranthene			87				
Anthracene			100				
Chrysene			160				
Fluorene			45				
Phenanthrene	55		490				
Pyrene	40		370				
<u>VOLATILE</u>							
Chloroform	2.9						

U. S. ENVIRONMENTAL PROTECTION AGENCY
SAMPLING TRIP RESULTS JUNE, 1980

PRIORITY POLLUTANTS

SAMPLING LOCATION

	UPSTREAM SEDIMENT ug/kg	DOWNSTREAM AQUEOUS ug/l	DOWNSTREAM SEDIMENT ug/kg	STORM DRAIN MIDDLE DETENTION TANK - AQUEOUS ug/l	TRIBUTARY TO EAST DETENTION BASIN-AQUEOUS ug/l	UPSTREAM FORK ug/l	EAST SWAMP ug/l
<u>INORGANICS</u>							
Copper	3300		9000				44
Lead	59000		65000	60		380	160
Zinc	14000	68	30000	260	55	76	580
Arsenic	1000		4600			10	
Antimony							16
Mercury	230		690				0.47

000653

APPENDIX B
MITRE FORM

000854

**APPENDIX E
MODEL WORKSHEETS**Site Name: Seaview Square MallLocation: Asbury Park, N.JEPA Region: Region IIPerson(s) in Charge of the Site: B.J. JohnsonDave CesareoName of Reviewer: Amelia J. JaniszSite Overall Score: 2.30**General Description of the Site:**

(For example: landfill, surface impoundment, pile, container; types of wastes; location of the site; contamination route of major concern; types of information needed for rating; agency action, etc.)

The mall is sited atop an old sanitary landfill in southern New Jersey which totals 132 acres. Private drinking water wells are located within a half mile of the site. The EPA and FIT samples showed contamination of groundwater, surface water and sediments by polynuclear aromatic hydrocarbons and inorganics. Suspected contamination of the groundwater for drinking is the major concern. The site score is artificially low since the total waste quantity is unknown.

ROUTE - GROUND WATER

Rating Factor	Basis of Information	Site Rating (Circle One)	Multiplier	Site Score	Maximum Possible Score
1 OBSERVED RELEASE (per GW 1)					
Measure Level or Evidence of Release	Samples	0 1 2 3 4	1	45	45
If the site score is zero, go to step 2 otherwise, go to step 5					
2 ROUTE CHARACTERISTICS ¹ (per GW 2)					
Depth to Aquifer of Concern		0 1 2 3	2	—	0
Net Precipitation		0 1 2 3	1	—	3
Permeability of Unsaturated Zone		0 1 2 3	2	—	0
Subtotal				—	10
3 CONTAINMENT ^{1,2} (per GW 3)					
Containment		0 1 2 3	1	—	3
4 POTENTIAL FOR RELEASE					
Multiply site score from 2 by site score from 3. The product is site rating for this route.					
5 RELEASE					
Enter site score from 1 or 4				45	45
6 WASTE CHARACTERISTICS ^{1,3} (per GW 4)					
Physical State	Liquid	0 1 2 3 4	1	3	3
Persistence	Chloroform	0 1 2 3 4	2	6	0
Toxicity/Infectiousness	Chloroform	0 1 2 3 4	2	6	0
Subtotal				15	10
7 HAZARDOUS WASTE QUANTITY ¹ (per GW 5)					
Total Waste Quantity	Unknown	0 1 2 3 4 5	1	0(1)	0
(By Subfund definition) excluding waste that is easily removed					
8 TARGETS ¹ (per GW 6)					
Ground Water Use	ET Survey	0 1 2 3	2	6	0
Distance to Nearest Well Downgradient	Measured	0 1 2 3	2	6	0
Population Served by Ground Water Within 1 Mile Radius	Public Water Co.	0 1 2 3 4	0	24	30
Subtotal				36	40
9 GROUND WATER ROUTE SUBTOTAL					
A. Multiply 8 x 6 x 7 x 8				24,300	162,000
B. Multiply (A.) by Normalization Factor of 0.6 and Divide by 1,000				0.6	14.58
				(B.) Route Subtotal	07.2

¹ Rating of zero should be entered when data is unavailable to rate an additive factor. A rating of 1 should be entered when data is unavailable to rate a multiplicative category such as the waste quantity or containment. A total of 0% missing data for the entire site is allowed when rating a site.

² If the site has more than one type of containment (e.g., surface impoundment, landfill, covering, separator of access responsibility) and enter the score from the worst case.

³ Enter the two most hazardous wastes. Select the one with the highest subtotal score and enter that score.

ROUTE - SURFACE WATER

Rating Factor	Basis of Information	Site Rating (Circle One)	Multiplier	Site Score	Maximum Possible Score
1 OBSERVED RELEASE per SW 1					
Measured level of evidence of release	Samples	0 1 2 3 4	1	45	45
If the site score is zero, go to step 2 otherwise, go to step 5					
2 ROUTE CHARACTERISTICS ^{1,2} per SW 2					
Site Slope and Terrain		0 1 2 3	1	—	3
1 Year 24 Hour Rainfall		0 1 2 3	1	—	3
Distance to Surface Water		0 1 2 3	1	—	3
Flow Potential		0 1 2 3	2	—	6
Subtotal				—	15
3 CONTAINMENT ^{1,2} per SW 3					
Containment		0 1 2 3	1	—	3
4 POTENTIAL FOR RELEASE					
Multiply site score from 2 by site score from 3. The product is site rating for this route.			1	—	45
5 RELEASE					
Enter site score from 1 or 4				45	45
6 WASTE CHARACTERISTICS ^{1,2} per SW 4					
Physical State	Liquid	0 1 2 3 4	1	3	3
Toxicity/Infectiousness	Chloroform	0 1 2 3 4	2	6	6
Persistence	Chloroform	0 1 2 3 4	2	6	6
Subtotal				15	15
7 HAZARDOUS WASTE QUANTITY ¹ per SW 5					
Total Waste Quantity	Unknown	0 1 2 3 4 5	1	0(1)	5
By Superfund definition (excluding waste that is easily contained)					
8 TARGETS ¹ per SW 6					
Surface Water Use	NJDEP	0 1 2 3	3	6	9
Critical Habitats	USGS Map	0 1 2 3	2	2	6
Population Served by Surface Water Within 2 Miles Downstream From Site	Water Co.	0 1 2 3 4 5	0	0	30
Subtotal				8	45
9 SURFACE WATER ROUTE SUBTOTAL					
A. Multiply 5 x 6 x 7 x 8				5400	151,575
B. Multiply [A.] by normalization factor of 0.64 and divide by 1,000			0.64	3.46	97.2
				[B.] Route Subtotal	

ROUTE - AIR

Rating Factor	Basis of Information	Site Rating (Circle One)	Multiplier	Site Score	Maximum Possible Score
1 OBSERVED RELEASE* (ref A 1)					
Evidence of Release	Observed	0	45	0	45
If the site score is zero, the route subtotal score is zero, otherwise, go to Step 2					
2 RELEASE					
Enter site score from 1				0	45
3 WASTE CHARACTERISTICS ^{1,3} (ref A 2)					
Physical State/Volatility	Unknown	0	1 2 3	1	0
Reactivity	Unknown	0	1 2 3	1	0
Incompatibility	Unknown	0	1 2 3	1	0
Toxicity/Infectiousness	Unknown	0	1 2 3	2	0
Subtotal				0	45
4 HAZARDOUS WASTE QUANTITY* (ref A 3)					
Total Waste Quantity	Unknown	0	1 2 3 4 5	1	0 (1)
By Superfund definition, excluding waste that is totally contained					
5 TARGETS* (ref A 4)					
Distance to Nearest Population	N/A	0	1 2 3	2	—
Population Within 1 Mile Radius	N/A	0	1 2 3 4 5	5	—
Critical Environments	N/A	0	1 2 3	2	—
Land Use	N/A	0	1 2 3	1	—
Subtotal				—	45
6 AIR ROUTE SUBTOTAL					
A. Multiply 2 x 3 x 4 x 5				0	135,000
B. Multiply (A.) by normalization factor of 0.72 and divide by 1,000				0.72	0
				(B.) Route Subtotal	97.2

*Only air monitoring data will be considered as evidence of release.

10 AGGREGATE SITE RATING			
Route	Route Subtotal from 6 or 9	Route Subtotal Squared	Maximum Possible Score
Ground Water	14.58	212.58	$(97.2)^2 = 9447.84$
Surface Water	3.46	11.97	$(97.2)^2 = 9447.84$
Air	- 0 -	- 0 -	$(97.2)^2 = 9447.84$
Sum		224.55	28,343.52
Square Root of Sum		14.99	168.36
Overall Score* =	$\frac{\text{sum} \times 100}{168.36}$	2.30	100

FIRE AND EXPLOSION	
Route Subtotal from 8	Maximum Possible Score
	97.2
Adjusted Score =	$\frac{\text{Route Subtotal} \times 100}{97.2}$

DIRECT CONTACT	
Route Subtotal from 8	Maximum Possible Score
	97.2
Adjusted Score =	$\frac{\text{Route Subtotal} \times 100}{97.2}$

*The overall and adjusted scores will be between 0 and 100. The maximum overall score for a site with only one exposure route is 57.7.

000859

WORKSHEET FOR HAZARDOUS WASTE
SITE RANKING MODEL

FIT QUALITY ASSURANCE TEAM

GENERAL

Site name and location: Seaview Square Mall
Asbury Park, N.J.

Date(s) of site scoring: October 19, 1981

Primary source(s) of information (e.g., EPA region, state, FIT, etc.):
Field Investigation Team/EPA Region II

Factors not scored (assigned 0 for additive and 1 for multiplicative)
due to insufficient information:

Radioactivity
Total Waste Quantity

Comments or qualifications:

The presence of inorganics and polynuclear aromatic hydrocarbons in excess of EPA Water Quality Criteria Standards (1980) has been established. No information on waste generators or amount of waste gives this site an artificially low score.

GROUND WATER PATHWAY

1 Measured Level or Evidence of Release

Describe substance(s) and nature of release:

Samples were taken by the EPA (1980) and FIT (1981). Results showed mercury, beryllium and polynuclear aromatic hydrocarbons.

Describe method of measurement or observation:

Sampling of sediments and streams and observation by FIT.

2 Depth to Aquifer of Concern

Describe/name aquifer of concern:

Groundwater comes from the Raritan Magothy formation.

Why is above aquifer of concern?

The aquifer is used for drinking water.

Depth and how determined, including sources:

0 to 20 feet - Tom Cracow, Abbington - Ney Construction Co. This company dug into the groundwater when they were constructing the mall.

Net Precipitation

Net precipitation and how determined, including source(s):

+ 15 Table D-1 Mitre Report

Permeability of Unsaturated Zone

Soil type(s) in unsaturated zone:

Sand, loamy sand, sandy loam - FIT observed

Permeability and how determined, including source(s):

Table D-1-A Mitre Report

[3] Containment

Method of waste management (e.g., surface impoundment, landfill, etc) of extreme case:

Landfill - no liner

Describe basis for selecting extreme case:

FIT questioned the management of Seaview Square Mall, consulted with FIT hydrogeologists on area geology and talked to the County Health Officer. The mall maybe over a clay lense, but the extent of the lense is unknown and these are often permeable.

Describe method(s) of waste or leachate containment for above extreme case:

A leachate collection system exists under the mall parking lot, but dumps leachate directly into the city sewers.

Cite source(s) of information:

Mr. Robert Dolan - Seaview Square Joint Venture & Goodman Company
FIT hydrogeologists; Ocean County Health Officer - Hugh McCloskey

[6] Physical State

Physical state of waste and source of information:

Liquid - leachate observed at site by FIT

Persistence

Most persistent compound subject to transport via ground water:

Chloroform - EPA samples

Basis for selecting compound, including source(s):

Present in Table D-2 Mitre Report and one of most persistent compounds in EPA samples

Basis for selecting persistence rating score:

Table D-2 Mitre Report

Toxicity/Infectiousness

Toxic materials subject to transport via ground water and Sax or NFPA level for each:

Chloroform (3)

Phenanthrene (2)

Benzo(a)pyrene (3)

Mercury (3)

Chrysene (3)

Cite source(s) of information indicating toxics present on site:

Samples from streams - aqueous and sediment taken by EPA and FIT.

Infectious materials present on site and source(s) of information:

None known

Basis for selecting CDC classification of infectious materials:

N/A

[7] Total Waste Quantity

Total waste quantity present, including unit of measurement (e.g., tons, cubic yards drums):

Unknown

Basis for estimating or computing quantity, including source(s) of information:

Not possible to compute any quantity of waste.

[8] Ground Water Use

Use(s) of aquifer of concern and source(s) of information:

Drinking water - survey done by FIT.

Distance to Nearest Well Downgradient

Distance to nearest well downgradient:

1/2 mile

How was downgradient direction(s) established, including source(s) of information:

Consultation with FIT hydrogeologist; USGS topographic maps and FIT observation while at site

How was distance determined?:

Measurement from site on map to drinking wells found by survey.

Is nearest building known to be using ground water? Source of information:

No - survey by FIT

000663

Is nearest well known to be drawing from aquifer of concern? Source of information:

Yes - FIT hydrogeologists and proximity to site.

Population Served by Ground Water Within 3-Mile Radius

Population served with 3-mile radius:

8,500 - 12,500

How was population counted or computed, including source(s) of information:

50% - 75% of total Ocean Township population (17,000 - 25,000)
Minimum number of people served by groundwater was selected to provide a more conservative estimate.

Is population known to be served by aquifer of concern? Source of information:

Yes. Mr. Walling, Monmouth Consolidated Water Co., 10/28/81. He says Asbury Township Health Officer says 99% of Neptune on public water; 50-75% of Ocean Township on groundwater i.e. private drinking wells. Ocean Township is within the 3 mile radius per Hagstrom Maps.

SURFACE WATER PATHWAY

[1] Measured Level or Evidence of Release**Describe substances and nature of release:**

Polynuclear aromatic hydrocarbons and inorganics are released from the soil on the landfill in leachate and during sediment runoff.

Describe method of measurement or observation:

EPA and FIT sampling; observations by FIT

[2] Site Slope and Terrain**Computation of slope and description of points of measurement:**

140 foot contour line at top of landfill to 20 foot at stream;
120 foot drop over 1/2 mile.

Cite source(s) of information (topo maps, etc.):

USGS Topographic Map - Asbury Park, N.J.

Quadrangle

1-Year 24-Hour Rainfall**Amount of rainfall and source of information:**

+ 2.5 - 3.0" per Figure D-8 Mitre Report

Distance to Surface Water**Distance and description of points of measurement:**

Streams run through the site

Cite source(s) of information:

USGS Topographic Map - Asbury Park, N.J.

Quadrangle and observation by FIT.

Flood Potential**In what flood plain, if any, is the site located?:**

Atlantic coastal flood plain

Cite source(s) of information:

USGS Topographic Map - Asbury Park, N.J.

Quadrangle

[3] Containment**Describe basis for selecting extreme waste management case:**

FIT questioned the management of Seaview Square Mall, consulted with FIT hydrogeologists on area geology, and talked to County Health Officer.

Describe method(s) of waste or leachate containment for extreme case:

A leachate collection system exists under the mall parking lot but dumps leachate directly into the city sewers. The mall may be located over a clay lense, but the extent of the lense is unknown and these are often permeable.

Cite source(s) of information:

Mr. Robert Dolan - Seaview Square Joint Venture and Goodman Company
FIT hydrogeologist; Ocean County Health Officer - Hugh McCloskey.

[8] Surface Water Use**Use(s) of downstream surface water and sources of information:**

Used for fishing (NJ Department of Natural Resources) and boating (phone conversation with County Health Officer)

Critical Habitats**Location and description of downstream critical habitat, if any:**

Floodplain, but in this area, the ocean probably floods infrequently. Knowledge of history of area and likelihood of flooding.

Distance and description of points of measurement:

1-2 miles to Atlantic Ocean.

Cite source(s) of information:

USGS Topographic Map - Asbury Park, N.J. Quadrangle

Population Served By Surface Water with Water Intake Within 3 Miles Downstream from Site

Population served by water intake(s): None

Is surface water within 3 miles in a tidal estuary?: No

000666

Description(s) and location(s) of intake(s) and corresponding population served by each:

N/A

How was population counted or computed?:

N/A

Cite source(s) of water-intake and population information:

None - downstream water is not used for drinking (per Monmouth Consolidated Water Co.) and is not tidal (per NJ Department of Natural Resources)

AIR PATHWAY

[1] Evidence of Release

Describe contaminant and monitoring which reveal that background levels have been exceeded?:

No evidence and no information on atmospheric contamination was found.

Cite source(s) of information:

[3] Physical State/Volatility

Physical state of waste and source(s) of information:

N/A

Vapor pressure of waste and source(s) of information:

N/A

Reactivity

Reactive substances and source(s) of information:

N/A

NFPA level for each and basis of selection:

N/A

Incompatability

Incompatible substances which are present and source(s) of information:

N/A

Basis for selecting incompatibility score:

N/A

5 Distance to Nearest Population

Distance and description of points of measurement:

N/A

Cite source(s) of information:

N/A

Population Within 1-Mile Radius

Population and how counted or computed:

N/A

Cite source(s) of information:

N/A

Land Use

Location and type of determining land use:

N/A

Distance to determining land use:

N/A

Cite source(s) of information:

N/A

APPENDIX C
REFERENCES

000670

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